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INTELLECTUAL PROPERTY LAW

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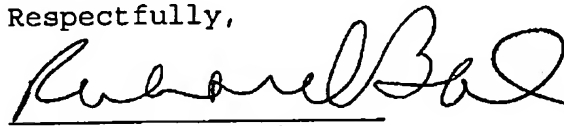
TO : EXAMINER Julian A. Mercado ART UNIT: 1745
FROM : RICHARD S. BARTH
RE : OUR DOCKET NO.: 03248C/HG
S.N. : 10/606,706

This has reference to a telephone conversation on even date between the undersigned and Ms. Felicia Allen of the USPTO, wherein Ms. Allen informed the undersigned that the AMENDMENT UNDER 37 CFR 1.111 dated October 12, 2006 has not been scanned into the file of the above-identified application.

Transmitted herewith is a copy of said AMENDMENT UNDER 37 CFR 1.111 dated October 12, 2006; a copy of the English-language Abstract for JP 58-206078, which was enclosed with said AMENDMENT UNDER 37 CFR 1.111 dated October 12, 2006; a copy of single sheet of a Table, which was also enclosed with said AMENDMENT UNDER 37 CFR 1.111 dated October 12, 2006; and a copy of the receipt postcard therefor with the PTO date stamp thereon of "OCT 12 2006", evidencing that said papers were received and filed in the USPTO on October 12, 2006.

The INFORMATION DISCLOSURE STATEMENT, which was also an enclosure with said AMENDMENT UNDER 37 CFR 1.111 dated October 12, 2006, is not being transmitted herewith, since Ms. Allen confirmed to the undersigned that it is has already been scanned into the file of the above-identified application.

Respectfully,



Richard S. Barth
Reg. No. 28,180

RSB/ddf
Encs.

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NOV 30 2006

IN THE UNITED STATES PATENT
AND TRADEMARK OFFICE

Serial No. : 10/606,706
Applicants : Eiki YASUKAWA et al.
Filed : June 25, 2003
For : NON-AQUEOUS ELECTROLYTE
AND LITHIUM SODIUM BATTERY

Art Unit : 1745

Examiner : Julian A. MERCADO

Docket No. : 03248C/HG

Customer No.: 01933

Confirm. No.: 5090

AMENDMENT UNDER 37 CFR 1.111

COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, VA 22313-1450

MAIL STOP AMENDMENT

S I R :

Responsive to the Office Action mailed July 12, 2006, the term for response to which expires on October 12, 2006, please amend the above-identified application as follows:

Amendments to the Specification begin on page 2 of this paper.

Amendments to the Claims are reflected in the listing of claims which begins on page 6 of this paper.

Remarks begin on page 18 of this paper.

Express Mail Mailing Label
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I hereby certify that this paper is being deposited with the United States Postal Service "Express Mail Post Office to Addressee" service under 37 CFR 1.10 with sufficient postage on the date indicated above and is addressed to:
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Dorothy DeFrancesco
Dorothy DeFrancesco

In the event that this Paper is late filed, and the necessary petition for extension of time is not filed concurrently herewith, please consider this as a Petition for the requisite extension of time, and to the extent not tendered by Form PTO-2038 attached hereto, authorization to charge the extension fee, and other fee required in connection with this Paper to Account No. 08-1378.

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Amendments to the Specification:

Please replace Table 1 on page 41 with the following amended Table 1:

Table 1

	Electrolyte			Cyclic phosphate		Conductivity (mS/cm)	Self- extinguishing property (sec)	Discharge capacity (mAh)	Exothermic ratio °C / min	Pressure elevating ratio x10 ⁵ Pa /min
	Solute	Solvent	Volume ratio	Kind	Amount formulat ed					
Example	1	LiPF ₆ LiPF ₆	GBL+EDMP	80:20	EEP	5	10.6	55	0.5	0.6
	2	LiPF ₆ LiPF ₆	GBL+TMP	80:20	EEP	5	11.5	61	0.7	1.1
	3	LiPF ₆ LiPF ₆	GBL+DEMP	70:30	EEP	5	9.9	58	0.6	0.5
	4	LiPF ₆ LiPF ₆	GBL+PDMP	70:30	EEP	10	9.6	54	1.0	0.8
	5	LiPF ₆	GBL+BDMP	70:30	EEP	10	8.3	52	0.9	0.8
	6	LiBF ₄	GBL+EDMP	60:40	MEP	5	7.2	54	0.2	0.3
	7	LiBF ₄	GVL+DEMP	70:30	MEP	5	5.1	50	0.6	0.8
	8	LiBF ₄	ECL+DEMP	70:30	MEP	5	4.6	49	0.8	0.6
Comparative Example	1	LiPF ₆	EC+DEC	50:50	None	-	8.3	60	162	165
	2	LiPF ₆	EC+DEC+TMP	60:20:20	None	-	8.9	0	-	-
	3	LiPF ₆	EC+DEC+TMP	60:20:20	EEP	5	8.7	40	21.3	16.7

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Please replace Table 7 on page 59 with the following amended Table 7:

Table 7

	Electrolyte					Anode material						
	Solute	Solvent	Volume ratio	Additive	Blend amount (wt%)	Calcining temperature (°C)	Average particle diameter d ₅ (μm)	Carbonaceous material(B) content (part by weight)	Raman value (-)	ABC /AB (-)	Graphite material (A)d002 (Å)	Carbonaceous material (B)d002 (Å)
Examples	37	LiBF ₄	TMP+GBL	VEC	5	1300	23	8	0.40	0.17	3.35	3.45
	38	[LiBF ₄] LiBF ₄	TMP+PC	VEC+VC	5+2	900	24	7	0.52	0.19	3.35	3.46
	39	[LiPF ₆] LiBF ₄	TMP+GBL+EC	VEC+VC	5+2	900	24	7	0.52	0.19	3.35	3.46
Comparative Examples	15	LiBF ₄	TMP	VEC	6	-	17	0	0.16	0.20	3.36	-
	16	LiBF ₄	TMP	VEC	5	-	15	0	0.17	0	3.36	-

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Please replace Table 8 on page 60 with the following amended Table 8:

Table 8

		Flash point (°C)	Conductivity (mS/cm)	First-cycle charge-discharge characteristics	
				Discharge capacity (Ah/kg)	charge-discharge efficiency (%)
Examples	37	None	6.7	<u>[[91]] 311</u>	<u>[[311]] 91</u>
	38	None	6.6	<u>[[90]] 330</u>	<u>[[330]] 90</u>
	39	None	6.7	<u>[[88]] 335</u>	<u>[[335]] 88</u>
Comparative Examples	15	None	5.1	0	0
	16	None	5.1	0	0

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Please replace Table 10 on page 65 with the following amended Table 10:

Table 10

		Flash point (°C)	Conductivity (mS/cm)	First-cycle charge-discharge characteristics	
				discharge capacity (Ah/kg)	charge- discharge efficiency (%)
Examples	40	None	5.0	[[88]] 362	[[362]] 88
	41	None	5.1	[[88]] 355	[[355]] 88
	42	None	5.1	[[91]] 358	[[358]] 91
	43	None	6.5	[[88]] 360	[[360]] 88
	44	None	6.7	[[90]] 357	[[357]] 90
	45	None	4.9	[[89]] 366	[[366]] 89
	46	None	6.6	[[86]] 354	[[354]] 86
Comparative Examples	17	None	4.9	0	0
	18	None	6.6	[[78]] 287	[[287]] 78

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Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

Claim 1. (withdrawn) A non-aqueous electrolyte for a lithium secondary battery to be used in combination with a positive electrode and a negative electrode capable of storing and releasing lithium, which comprises a non-aqueous solvent and a lithium salt dissolved therein,

wherein said non-aqueous solvent comprises:

- (a) a phosphate comprising both (a1) a chain state phosphate and (a2) a cyclic phosphate; and
- (b1) a cyclic carboxylate.

Claim 2. (withdrawn) The non-aqueous electrolyte according to claim 1, wherein said chain state phosphate (a1) is contained in said non-aqueous solvent in an amount of 10 to 60% by volume, based on the total volume of said chain state phosphate (a1) and said cyclic carboxylate (b1).

Claim 3. (currently amended) A non-aqueous electrolyte for a lithium secondary battery to be used in combination with a

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positive electrode and a negative electrode capable of storing and releasing lithium, which comprises a non-aqueous solvent and a lithium salt dissolved therein,

wherein said non-aqueous solvent comprises:

(a) at least one phosphate selected from the group consisting of (a1) a chain state phosphate and (a2) a cyclic phosphate;

(b1) a cyclic carboxylate; [[and]]

~~at least one compound selected from~~ (c1) a vinylene carbonate compound and (c2) a vinylethylene carbonate compound.

Claim 4. (original) The non-aqueous electrolyte according to claim 3, wherein said phosphate (a) is contained in said non-aqueous solvent in an amount of 10 to 90% by volume, based on the total volume of said phosphate (a) and said cyclic carboxylate (b1).

Claim 5. (withdrawn) A non-aqueous electrolyte for a lithium secondary battery to be used in combination with a positive electrode and a negative electrode capable of storing and releasing lithium, which comprises a non-aqueous solvent and a lithium salt dissolved therein,

wherein said non-aqueous solvent comprises:

(a) at least one phosphate selected from (a1) a chain state phosphate and (a2) a cyclic phosphate;

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at least one compound selected from (c1) a vinylene carbonate compound and (c2) a vinylethylene carbonate compound; and

at least one compound selected from the group consisting of (d1) a cyclic amide compound, (d2) a cyclic carbamate compound, and (d3) a heterocyclic compound.

Claim 6. (withdrawn) The non-aqueous electrolyte according to claim 5, wherein said non-aqueous solvent further comprises (b1) a cyclic carboxylate, wherein said phosphate (a) is contained in said non-aqueous solvent in an amount of 10 to less than 100% by volume, based on the total volume of said phosphate (a) and said cyclic carboxylate (b1).

Claim 7. (withdrawn) A non-aqueous electrolyte for a lithium secondary battery to be used in combination with a positive electrode and a negative electrode capable of storing and releasing lithium, said non-aqueous electrolyte comprising a non-aqueous solvent and a lithium salt dissolved therein

wherein said non-aqueous solvent comprises:

(a) at least one phosphate selected from (a1) a chain state phosphate and (a2) a cyclic phosphate; and

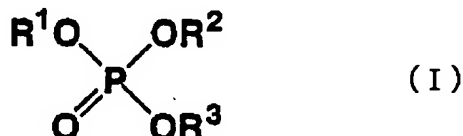
(c1) a vinylene carbonate compound and (c2) a vinylethylene carbonate compound.

Claim 8. (canceled)

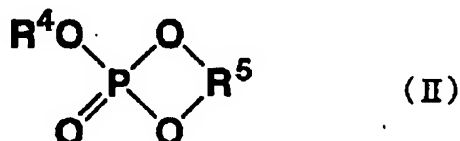
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Claim 9. (currently amended) The non-aqueous electrolyte according to any one of claims 1 to [[8]] 7, wherein said chain state phosphate (a1) is represented by said following formula (I):



wherein R¹ to R³ each independently represent an unsubstituted or fluorine-substituted linear or branched alkyl group having 1 to 4 carbon atoms,
and said cyclic phosphate (a2) is represented by the following formula (II):



wherein R⁴ represents an unsubstituted or fluorine-substituted, linear or branched alkyl group having 1 to 4 carbon atoms, and R⁵ represents a linear or branched alkylene group having 2 to 8 carbon atoms.

Claim 10. (original) The non-aqueous electrolyte according to claim 9, wherein said chain state phosphate (a1) is at least one chain state phosphate selected from the group consisting of trimethyl phosphate, trifluoroethyldimethyl phosphate, bis(trifluoroethyl)methyl phosphate and tris(trifluoroethyl)

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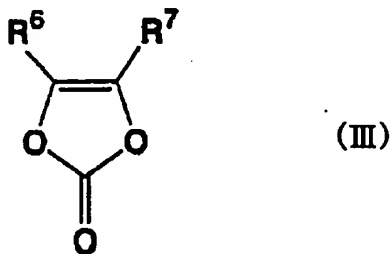
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phosphate, and said cyclic phosphate (a2) is at least one cyclic phosphate selected from the group consisting of ethylenemethyl phosphate, ethyleneethyl phosphate and ethylenetrifluoroethyl phosphate.

Claim 11. (currently amended) The non-aqueous electrolyte according to ~~any one of claims~~ [[1,]] claim 3, [[6,]] and [[8,]] wherein said cyclic carboxylate (b1) is at least one cyclic carboxylate selected from the group consisting of γ -butyrolactone, γ -valerolactone, γ -caprolactone, γ -octanolactone, β -butyrolactone, δ -valerolactone~~[[,]]~~ and ϵ -caprolactone.

Claim 12. (canceled)

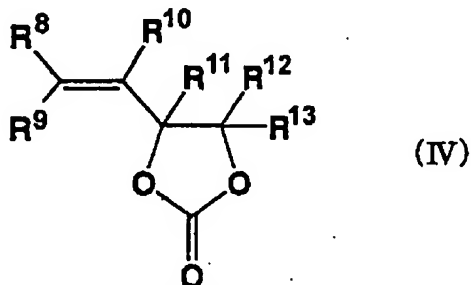
Claim 13. (original) The non-aqueous electrolyte according to any one of claims 3, 5 and 7, wherein said vinylene carbonate compound (c1) is represented by the following formula (III):

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wherein R⁶ and R⁷ each independently represent a hydrogen atom, an alkyl group having 1 to 4 carbon atoms, or a branched alkyl group,
and said vinylethylene carbonate compound (c2) is represented by the following formula (IV):



wherein R⁸ to R¹³ each independently represent a hydrogen atom, or a linear or branched alkyl group having 1 to 4 carbon atoms.

Claim 14. (original) The non-aqueous electrolyte according to claim 13, wherein said vinylene carbonate compound (c1) is at least one vinylene carbonate compound selected from the group consisting of vinylene carbonate, 4-methylvinylene carbonate, 4-ethylvinylene carbonate, 4,5-dimethylvinylene carbonate, 4,5-diethylvinylene carbonate and 4-methyl-5-ethylvinylene carbonate, and said vinylethylene carbonate compound (c2) is at least one vinylethylene carbonate compound selected from the group consisting of 4-vinylethylene carbonate, 4-vinyl-4-methylethylene carbonate, 4-vinyl-4-ethylethylene carbonate,

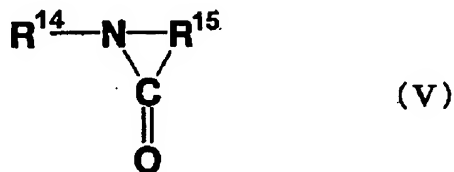
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4-vinyl-4-n-propylethylene carbonate, 4-vinyl-5-methylethylene carbonate, 4-vinyl-5-ethylethylene carbonate, and 4-vinyl-5-n-propylethylene carbonate.

Claim 15. (original) The non-aqueous electrolyte according to claim 13, wherein a content of at least one compound selected from said vinylene carbonate compound (c1) and said vinylethylene carbonate compound (c2) is 0.1 to 15% by weight based on the total weight of said non-aqueous electrolyte.

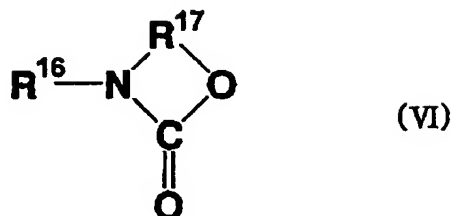
Claim 16. (withdrawn) The non-aqueous electrolyte according to claim 5 or 6, wherein said cyclic amide compound (d1) is represented by the following formula (V):



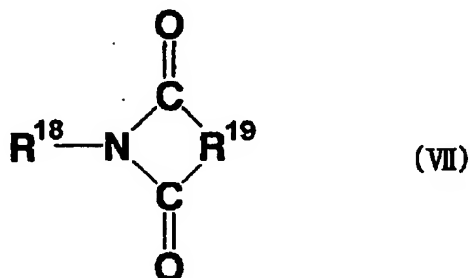
wherein R¹⁴ represents a linear or branched alkyl group having 1 to 4 carbon atoms, a vinyl group or an allyl group, or a cycloalkyl group, an aryl group or an aralkyl group having 6 to 8 carbon atoms, and R¹⁵ represents a divalent hydrocarbon group having 2 to 8 carbon atoms, said cyclic carbamate compound (d2) is represented by the following formula (VI):

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wherein R¹⁶ represents a linear or branched alkyl group having 1 to 4 carbon atoms, a vinyl group or an allyl group, or a cycloalkyl group, an aryl group or an aralkyl group having 6 to 8 carbon atoms, and R¹⁷ represents a divalent hydrocarbon group having 2 to 8 carbon atoms, and said heterocyclic compound (d3) is represented by the following formula (VII):



wherein R¹⁸ represents a linear or branched alkyl group having 1 to 4 carbon atoms, a vinyl group or an allyl group, or a cycloalkyl group, an aryl group or an aralkyl group having 6 to 8 carbon atoms, and R¹⁹ represents a divalent hydrocarbon group having 2 to 8 carbon atoms.

Claim 17. (original) The non-aqueous electrolyte according to claim 16, wherein a content of said at least one compound selected from the cyclic amide compound (d1), the cyclic

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carbamate compound (d2) and the heterocyclic compound (d3) is 0.1 to 15% by weight based on the total weight of the non-aqueous electrolyte.

Claim 18. (original) The non-aqueous electrolyte according to any one of claims 1, 3, 5 and 7, wherein said lithium salt is an inorganic acid lithium salt selected from LiPF_6 and LiBF_4 , or an organic acid lithium salt selected from the group consisting of LiCF_3SO_3 , $\text{LiN}(\text{CF}_3\text{SO}_2)_2$, $\text{LiN}(\text{C}_2\text{F}_5\text{SO}_2)_2$, $\text{LiN}(\text{CF}_3\text{SO}_2)(\text{C}_4\text{F}_9\text{SO}_2)$, $\text{LiPF}_3(\text{C}_2\text{F}_5)_3$ and $\text{LiB}(\text{CF}_3\text{COO})_4$.

Claim 19. (original) A lithium secondary battery comprising the non-aqueous electrolyte according to any one of claims 1, 3, 5 and 7, and a positive electrode and a negative electrode which are capable of storing and releasing lithium.

Claim 20. (original) The lithium secondary battery according to claim 19, wherein said negative electrode satisfies the following conditions:

(1) said negative electrode comprises an anode material comprising a graphite carbonaceous material (A) having a plane spacing d_{002} value of the (002) plane of less than 0.337 nm and a carbonaceous material (B) having the plane spacing d_{002} value of the (002) plane of 0.337 nm or more, as measured by wide-angle X-ray diffractometry;

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(2) that the weight ratio between said graphite carbonaceous material (A) and said carbonaceous material (B) is 99.5:0.5 to 50:50; and

(3) that said anode material has an R value of more than 0.2 and 1.5 or less, wherein the R value is represented by IB/IA wherein IA represents a peak intensity appearing in the range of from 1,570 to 1,620 cm^{-1} , and IB represents a peak intensity appearing in the range of from 1,350 to 1,370 cm^{-1} , as measured by Raman spectroscopy using an argon ion laser with a wavelength of 514.5 nm.

Claim 21. (original) The lithium secondary battery according to claim 20, wherein said graphite carbonaceous material (A) has at least part of a surface thereof coated with said carbonaceous material (B).

Claim 22. (original) The lithium secondary battery according to claim 20 or 21, wherein said anode material is obtained by calcining a mixture of said graphite carbonaceous material (A) and an organic material.

Claim 23. (original) The lithium secondary battery according to claim 22, wherein said calcination is conducted at a calcination temperature of 500 to 2,200°C.

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Claim 24. (original) The lithium secondary battery according to claim 20, wherein the R value of said anode material is 0.35 to 1.1.

Claim 25. (original) The lithium secondary battery according to claim 20, wherein the R value of said anode material is 0.4 to 0.9.

Claim 26. (original) The lithium secondary battery according to claim 20, wherein said anode material has an intensity ratio represented by $ABC(101)/AB(101)$ of 0.15 or more, wherein $AB(101)$ represents a peak intensity ascribed to the orientation of the hexagonal crystal system graphite layer, and $ABC(101)$ represents a peak intensity ascribed to the orientation of the rhombohedral crystal system graphite layer, as measured by wide-angle X-ray diffractometry.

Claim 27. (original) The lithium secondary battery according to claim 20, wherein said graphite carbonaceous material (A) has an intensity ratio represented by $ABC(101)/AB(101)$ of 0.2 or more.

Claim 28. (original) The lithium secondary battery according to claim 20, wherein said anode material comprising said graphite carbonaceous material (A) and said carbonaceous

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material (B) has a surface area of 0.5 to 25 m²/g as measured by a BET method.

Claim 29. (original) The lithium secondary battery according to claim 20, wherein said anode material comprising said graphite carbonaceous material (A) and said carbonaceous material (B) has a particle diameter of 4 to 40 μ m.

Claim 30. (currently amended) The lithium secondary battery according to claim 19, wherein said negative electrode comprises at least one anode material selected from the group consisting of a carbonaceous material having a d value of the (002) plane of 0.335 to 0.34 nm as measured by X-ray diffractometry, an oxide of at least one metal selected from the group consisting of Sn, Si[[,]] and Al, and an alloy of lithium and at least one metal selected from the group consisting of Sn, Si[[,]] and Al.

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R E M A R K S

The above amendments to Table 1 on page 41 of the specification serve to correct minor clerical errors.

Applicants provided the following comments concerning the above amendments to Table 7 on page 59 of the specification:

On page 59, Table 7, "LiBF₆" in the column of "Solute" of Example 38 should read as "LiBF₄" as set forth in the column of "Solute" of Example 37.

On page 59, Table 7, "LiPF₅" in the column of "Solute" of Example 39 should read as "LiPF₆" as set forth in the column of "Solute" in Tables 1-3, 5 and 9 on pages 41, 44, 46, 51 and 64, respectively, of the specification.

Applicants provided the following comments regarding the above amendments to Table 8 on page 60 of the specification and Table 10 on page 65 of the specification:

On page 60, Table 8 and on page 65, Table 10, the numerical values of "discharge capacity (Ah/kg)" and "charge-discharge efficiency (%)" were inadvertently exchanged with each other in all the Examples and in Comparative Example 18. It is considered that the errors are obvious from the description of Tables 4 and 6 on pages 49 and 53, respectively, of the specification, and the

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correction of the errors are obvious, based on the fact that the values of "charge-discharge efficiency (%)" must be a value between 0 and 100.

It is respectfully submitted that the public interest would be served if the above specification amendments are entered, since the errors occurred in the reporting of experimental testing, which experimental testing could have been presented in a Declaration Under 37 CFR 1.132.

Following the Examiner's request at the top of page 2 of the office Action, enclosed is a full English-language abstract for JP 58-206078.

Claim 3 was amended so that the components (c1) and (c2) are both contained simultaneously. This amendment is supported by the description of the specification, specifically by Examples 26 and 27 in Tables 3 and 4 on pages 46 and 49, respectively, of the present specification; Examples 34 and 36 in Tables 5 and 6, respectively, on pages 51 and 53 of the present specification; and Example 39 in Tables 7 and 8 on pages 59 and 60, respectively, of the present specification.

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Claims 8, 12 and 30 were objected to for the reasons set forth at the middle of page 3 of the office Action under the heading "Claim Objections."

It is respectfully submitted that the above cancellation of claims 8 and 12 and the above amendment to claim 30 avoids the claim objections.

Claims 8, 11 and 12 were rejected under 35 USC 112, second paragraph, for the reasons set forth under the heading "Claims Rejections - 35 USC § 112" bridging pages 3 and 4 of the Office Action.

It is respectfully submitted that the above cancellation of claims 8 and 12 and the above amendment to claim 11 serve to avoid the 35 USC 112, second paragraph rejection.

It is respectfully submitted that the present claims comply with all the requirements of 35 USC 112.

The present claim 3 is directed to a non-aqueous electrolyte for a lithium secondary battery to be used in combination with a positive electrode and a negative electrode capable of storing and releasing lithium, which comprises a non-aqueous solvent and a lithium salt dissolved therein,

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wherein the non-aqueous solvent comprises:

(a) at least one phosphate selected from the group consisting of (a1) a chain state phosphate and (a2) a cyclic phosphate;

(b1) a cyclic carboxylate;

(c1) a vinylene carbonate compound and

(c2) a vinylethylene carbonate compound .

The advantageous results afforded by the present claims are described on page 1, lines 28-35 of the present specification as follows.

The non-aqueous electrolyte of the present claims has flame retardancy (self-extinguishing property) or nonflammability (having no flash point) and high conductivity, as well as electrochemical stability. In addition, a secondary battery using the non-aqueous electrolyte of the present claims exhibits excellent battery charge-discharge characteristics and has extremely high battery safety.

Claims 3, 4, 8 to 15, 18 and 19 were rejected under 35 USC 102 as being anticipated by Tan et al. (JP 11-260401) for the reasons set forth under the heading "Claim Rejections - 35

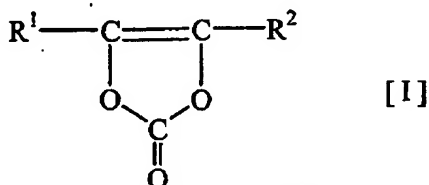
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USC § 102" on pages 4 and 5 of the Office Action.

Tan et al. (JP 11-260401) disclose the following:

"[Claim 1] Nonaqueous electrolyte characterized by consisting of a non-aqueous solvent containing the vinylene carbonate derivative expressed with the following general formula [I], and a phosphoric acid ester compound, and an electrolyte.



(Among a formula, even if R¹ and R² are mutually the same, they may differ from each other, and they show a hydrogen atom or the alkyl group of carbon numbers 1-3.)"

As pointed out in the paragraph bridging pages 4 and 5 of the Office Action, in column [0033] of Tan et al., it is disclosed that gamma-butyrolactone may be contained, and in column [0026] of Tan et al., it is disclosed that the amount of a phosphate compound is preferably 3 to 25% by volume.

The stated aims of Tan et al. are that the flame retardancy of the secondary battery containing the above-mentioned non-aqueous electrolyte is high, it is safe, a high voltage can be produced and the charge-discharge performance of the battery is

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excellent (see paragraph [0006] of Tan et al.).

One of the most important characteristic features of applicants' present claim 3 resides in using (a) at least one phosphate selected from the group consisting of (a1) a chain state phosphate and (a2) a cyclic phosphate; and (b1) a cyclic carboxylate; in combination with both of (c1) a vinylene carbonate compound and (c2) a vinylethylene carbonate compound simultaneously.

Tan et al. do not teach or suggest using (c2) a vinylethylene carbonate compound as recited in applicants' present claim 3.

Withdrawal of the anticipation rejection is thus respectfully requested.

Claims 20 to 27 were rejected under 35 USC 103 as being unpatentable over Tan et al. in view of Sonobe et al. (USP 5,527,643) and Kameda et al. (USP 6,632,569) for the reasons indicated on pages 6 and 7 of the Office Action.

It was admitted in the Office Action that Tan et al. do not explicitly teach a graphite carbonaceous material having a first

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plane spacing d_{002} value, or a second carbonaceous material having a second plane spacing d_{002} value.

Claims 28 to 30 were rejected under 35 USC 103 as being unpatentable over Tan et al. in view of Sonobe et al. and Kameda et al. and further in view of Watanabe et al. (USP 6,682,856) for the reasons beginning at the middle of page 7 of the Office Action.

It was admitted in the Office Action that Tan et al. do not explicitly teach the claimed surface area or particle diameter for the carbonaceous material or a metal selected from Sn, Si and Al.

Tan et al. was discussed above.

Sonobe et al. (USP 5,527,643) disclose the following in columns 21 to 22:

"1. A carbonaceous electrode material for a non-aqueous solvent-type secondary battery, comprising a carbonaceous material having an average (002)-plane spacing d_{002} of 0.336-0.375 nm and a crystallite size in c-axis direction $L_{c(002)}$ of at most 50 nm, respectively, as measured by X-ray diffraction method, and an optically anisotropic texture showing a fine mosaic texture when observed through a polarizing microscope."

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The following is disclosed in column 2, lines 27 to 34 of
Sonobe et al.:

"According to our study, it has been found possible to provide a carbonaceous material capable of providing a non-aqueous solvent-type secondary battery having a large charge-discharge capacity, an excellent charge-discharge cycle characteristics and a small irreversible capacity (a high efficiency of active substance utilization) by properly controlling the microscopic structure of the carbonaceous material."

The following is disclosed in column 3, lines 24 to 39 of
Kameda et al. (USP 6,632,569):

"To accomplish the above objects, as a result of diligent researches done by the inventors, the inventors have discovered that, to improve the property of the electrode, a large discharging capacity is maintained by rendering the inside of the graphite particles high crystal that where the thickness direction of the graphite particles formed in a plate shape is designated to be relatively thick and where graphite particles having a higher existing ratio of edge portions since portions near the particle surfaces, particularly, basal surfaces are rough are used, the amount of portions at which the lithium ions can enter and exit is increased, and that an electrode can have a large capacity, rapid charging and discharging property, and excellent cycle characteristics by arrangement of particles in a further isotropic form, namely, by more isotropic arrangement of the edge portions using graphite particles having a shape closer to a spherical shape and carbonaceous materials having high filling property. "

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The following is disclosed in Watanabe et al. (USP 6,682,856):

"1. A non-aqueous electrolyte secondary battery comprising:

a positive-electrode, the positive electrode comprising a lithium-containing oxide;

a negative electrode comprising a carbonaceous material and

a non-aqueous electrolyte comprising a non-aqueous solvent, the non-aqueous solvent comprising at least one non-cyclic ester and an oxidation resistance improving agent, said oxidation resistance improving agent being an aryl-substituted alkyl compound in which 3 or more alkyl groups are substituted with aryl groups."

The following is disclosed in column 2, lines 34 to 43 of Watanabe et al. (USP 6,682,856):

"The present invention which is based on the new knowledge on the behavior of oxidative decomposition of electrolyte relates to a non-aqueous electrolyte secondary battery using a lithium-containing oxide as a positive electrode active material, a material capable of absorbing and releasing lithium as a material of negative electrode, and a non-aqueous solvent containing at least one non-cyclic ester as a non-aqueous electrolyte, characterized in that an oxidation resistance improving agent is added to the non-aqueous electrolyte, and, thus, increase of internal pressure or leakage of electrolyte can be effectively inhibited by improving the oxidation resistance of the electrolyte.. "

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As discussed above, one of the most important characteristic features of applicants' claim 3 resides in using (a) at least one phosphate selected from (a1) a chain state phosphate and (a2) a cyclic phosphate; and (b1) a cyclic carboxylate; in combination with both of (c1) a vinylene carbonate compound and (c2) a vinylethylene carbonate compound simultaneously.

In the cited references of Sonobe et al., Kameda et al., and Watanabe et al., only various kinds of negative electrodes are disclosed, but there is no teaching or suggestion to use the specific electrolyte as defined in applicants' present claim 3. These references also do not teach or suggest the advantageous results afforded by applicants' claims.

By using (c1) a vinylene carbonate compound and (c2) a vinylethylene carbonate compound in combination as components of an electrolyte, first-cycle charge-discharge characteristics and third-cycle charge-discharge characteristics are all excellent as shown in the attached Table and Tables 5 and 6 (Examples 29-36 and Comparative Examples 11-14) on pages 51 and 53, respectively of the present specification.

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Applicants have informed the undersigned that the reason why the electrolyte containing both of (c1) a vinylene carbonate compound and (c2) a vinylethylene carbonate compound in combination gives excellent results is as follows. It is considered that at the time of charging, according to an electrochemical reaction at a negative electrode, (c1) a vinylene carbonate compound and (c2) a vinylethylene carbonate compound are decomposed by reduction, and as a result, an extremely good film is formed on the negative electrode which film could never be obtained by using only by the (c1) compound or by using only the (c2) compound, whereby decomposition of phosphate by reduction can be effectively controlled.

In view of the above, withdrawal of each of the obviousness rejections is respectfully requested.

Reconsideration is requested. Allowance is solicited.

An INFORMATION DISCLOSURE STATEMENT is being filed concomitantly herewith.

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Response to Office Action mailed June 12, 2006

If the Examiner has any comments, questions, objections or recommendations, the Examiner is invited to telephone the undersigned at the telephone number given below for prompt action.

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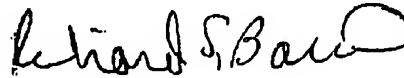
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RSB/ddf

Respectfully submitted,



Richard S. Barth

Reg. No. 28,180

Enclosures: (1) English-language abstract for
JP 58-206078
(2) Table
(3) INFORMATION DISCLOSURE STATEMENT

1/7/5
DIALOG(R) File 347:JAPIO
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01268678 **Image available**
BATTERY

#3
PUB. NO.: [REDACTED]
PUBLISHED: December 01, 1983 (19831201)
INVENTOR(s): SHISHIKURA RIICHI
SAWADA YOSHIMITSU
NAKAMURA HIDENORI
KOBAYASHI MASAO
APPLICANT(s): SHOWA DENKO KK [000200] (A Japanese Company or Corporation),
JP (Japan)
HITACHI LTD [000510] (A Japanese Company or Corporation), JP
(Japan)
APPL. NO.: 57-088765 [JP 8288765]
FILED: May 27, 1982 (19820527)

ABSTRACT

PURPOSE: To obtain a battery with high energy density, high charge and discharge efficiency, long cycle life span, good flatness of voltage, small self discharge rate, and easy light weight and compactness by using a

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specific phosphate compound as the organic solvent of an electrolyte.

CONSTITUTION: A phosphate compound represented by the following general formula is used as the organic solvent of an electrolyte. A thermal composition material such as polyacrylonitrile can be recommended as high polymer compounds with a conjugated double bond in a principal chain to be used, but are not restricted. The high polymer compound with the conjugated double bond in the principal chain can be recommended. Either chemical or electrochemical doping can be recommended as the doping method of a dopant into the high polymer compound (conjugated high polymer compound) with the conjugated double bond in the principal chain.

?B 352

23jul03 06:19:41 User382308 Session D4507.3

\$2.59 0.237 DialUnits File347

\$8.00 5 Type(s) in Format 7

\$8.00 5 Types

\$10.59 Estimated cost File347

DLGNET 0.066 Hrs.

\$10.59 Estimated cost this search

\$11.18 Estimated total session cost 0.475 DialUnits

File 352:Derwent WPI 1963-2003/UD, UM &UP=200346
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Table 3		Table 4				Table 5			
Electrolyte		Additive				Additive			
Solute	Solvent	Volume ratio	Kind	Amount formulate d(wt%)	Kind	Solute	Solvent	Volume ratio	Kind
28	LIBF4	DEMP+GBL	25:75	VEC+VC	8+2	34	LIPF6	TMP+GBL	80:20
27	LIBF4	DEMP+GBL	40:60	VEC+VC	8+2	36	LIPF6	TFEDMP+GBL	80:20
Com. 1 of 28	LIBF4	DEMP+GBL	25:75	VEC	8	Com. 1 of 34	LIPF6	TMP+GBL	80:20
Com. 2 of 28	LIBF4	DEMP+GBL	25:75	VC	2	Com. 2 of 34	LIPF6	TMP+GBL	80:20
Com. 1 of 27	LIBF4	DEMP+GBL	40:60	VEC	8				
Com. 2 of 27	LIBF4	DEMP+GBL	40:60	VC	2				

Table 6		Table 7				Table 8			
Electrolyte		Additive				Additive			
Solute	Solvent	Volume ratio	Kind	Amount formulate d(wt%)	Kind	Solute	Solvent	Volume ratio	Kind
34	LIPF6	TMP+GBL	80:20	VEC	5	39	LIPF6	TMP+GBL+EC	60:20:20
36	LIPF6	TFEDMP+GBL	80:20	VEC	8	Com. 1 of 39	LIPF6	TMP+GBL+EC	60:20:20
Com. 1 of 34	LIPF6	TMP+GBL	80:20	VEC	5	Com. 2 of 39	LIPF6	TMP+GBL+EC	60:20:20
Com. 2 of 34	LIPF6	TMP+GBL	80:20	VEC	5				

Table 3		Table 4				Table 5			
Electrolyte		Additive				Additive			
Solute	Solvent	Volume ratio	Kind	Amount formulate d(wt%)	Kind	Solute	Solvent	Volume ratio	Kind
34	LIPF6	TMP+GBL	80:20	VEC	5	39	LIPF6	TMP+GBL+EC	60:20:20
36	LIPF6	TFEDMP+GBL	80:20	VEC	8	Com. 1 of 39	LIPF6	TMP+GBL+EC	60:20:20
Com. 1 of 34	LIPF6	TMP+GBL	80:20	VEC	5	Com. 2 of 39	LIPF6	TMP+GBL+EC	60:20:20
Com. 2 of 34	LIPF6	TMP+GBL	80:20	VEC	5				

Note: Numerical data of discharge capacity (Ah/kg) and charge-discharge efficiency (%) were erroneously exchanged to each other so that these values are corrected.

DOCKET NO.: 03248C/HG
SN 10/606,706 - Eiki YASUKAWA et al.
AMENDMENT UNDER 37 CFR 1.111,
ENGLISH-LANGUAGE ABSTRACT FOR
JP 58-206078, SINGLE SHEET OF TABLE;
INFORMATION DISCLOSURE STATEMENT,
including FORM PTO/SB/08A AND COPIES
OF JAPANESE PUBLS. CITED THEREIN AND
WO PUBL. CITED THEREIN, INCLUDING
ENGLISH LANGUAGE ABSTRACT OF EACH;
JAPANESE OFFICE ACTION DATED
AUGUST 22, 2006 AND ENGLISH
LANGUAGE TRANSLATION THEREOF, AND
FORM PTO-2038 IN THE AMOUNT OF \$180.
EXPRESS LABEL EV 919 339 237 US
DATE OF DEPOSIT: OCTOBER 12, 2006
DUE: OCTOBER 12, 2006
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